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STUDENTS' MATHEMATICS PROBLEM-SOLVING VIEWED FROM MATHEMATICS ANXIETY AND GENDER

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***Abstract*:**
Some internal factors influence problem-solving ability. Some internal factors that presumably influence problem-solving are mathematics anxiety and Gender. This study aims to determine problem-solving abilities regarding mathematics anxiety and Gender. It is a quantitative research that involves 66 students of a Junior High School in Yogyakarta. The sampling technique used is a simple random sampling technique. The instruments in this study were a problem-solving ability test and a mathematics anxiety questionnaire. The data analysis technique used is Two Way ANOVA. The results show differences in problem-solving ability regarding the students' mathematics anxiety levels. However, there was no difference in students' mathematical problem-solving abilities between male and female students. On the other hand, there is no difference in students' mathematical problem-solving abilities in terms of the level of mathematics anxiety and Gender.

Keywords: problem-solving ability, mathematics anxiety, Gender

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INTRODUCTION

Mathematics is a field of science whose existence is considered very supportive of human life. Therefore, according to Siagian (2016), mathematics is a science that students must master because mathematics is in human life. Mathematics is a science studied at all education levels, from an early age to university (Adrian & Apriyanti, 2019; Akbar et al., 2017; Bernard et al., 2018; Utami et al., 2020). The purpose of studying mathematics is to strengthen the understanding of basic concepts in mathematics (Hidayat & Banjarnahor, 2017). A student must try to achieve it with attempting to explore mathematical concepts, reasoning, solving problems, discussing ideas, and implementing them in life.

The main demands that Human Resources must consider in this increasingly sophisticated era include three abilities: the ability to think creatively, to think critically, and to solve problems (N. P. W. Pratiwi et al., 2019). Problem-solving ability is defined as an activity or process of finding a way out of a problem, one of which is by utilizing mathematics. Four completion steps can be solutions as

problem-solving, namely understanding the existing problems, making plans to determine solutions, implementing solutions according to plan, and finally checking again (Marlina, 2013; Rambe & Afri, 2020; Suhita Lestari et al., 2020). Schools are responsible for understanding their students' material, especially their problem-solving abilities. This ability is a significant potential that needs to be appropriately studied by students, especially regarding solving mathematical problems, which are the primary fields of science in schools. But what happens in learning, students' problem-solving abilities are still not optimally mastered. According to Hidayat & Sariningsih (2018), several factors presumably influence problem-solving skills. One of them is how teachers deliver material that is considered not optimal. Besides that, many schools still have minimal facilities or infrastructure to support learning, especially in mathematics.

Apart from external factors, internal factors are a more important reason for the cause of students' low mathematics learning outcomes compared to the causes of external factors (Jayantika et al., 2013; Subekti et al., 2021). Internal factors influence problem-solving abilities, including mathematics anxiety (Adhimah & Ekawati, 2020; Kurniawati, 2014; Lutfiyah et al., 2019). Mathematics anxiety causes students to be unable to adapt, so they experience difficulties in mathematics. It causes low learning outcomes and student achievement in mathematics (Winarso & Supriady, 2016). Mathematics anxiety is an adverse emotional reaction to mathematics that impacts students' ability to accept mathematics learning (Carey et al., 2017). In line with this, Shishigu (2018) stated that mathematics anxiety is a psychological factor that hinders students from learning mathematics. Mathematical Anxiety can also be interpreted as a condition of students who feel afraid, worried, and tense with everything related to mathematics (Ehom, 2015). Thus, mathematics anxiety is an adverse emotional reaction in the form of worry, tension, and fear of everything related to mathematics which can hinder students' ability to learn mathematics.

The causes of Mathematics Anxiety will grow if students have persistent feelings of frustration in undergoing learning. Student anxiety will affect these students' learning process at school and wherever students study. Even Anxiety will make students avoid sources of Anxiety, or hysterical feelings will arise when they know things about mathematics. Several studies have shown a negative relationship between mathematics anxiety and math problem-solving abilities (Adhimah & Ekawati, 2020; Wahyu Hidayat & Ayudia, 2019; Kurniawati, 2014; Lutfiyah et al., 2019; Sakarti, 2018).

In addition to the anxiety factor, another important factor that supports the potential to overcome students' math problems is the gender factor (MZ, 2013). Several studies (Anggraeni & Herdiman, 2018; Annisa et al., 2021; Davita & Pujiastuti, 2020; Nur & Palobo, 2018) state that women's mathematical problem-solving abilities are better than men's problem-solving abilities. However, other studies state that male students' problem-solving scores are higher than female students (Fitriani et al., 2015). On the other hand, research by Indrawati & Tasni (2017) shows that women solve math problems very carefully, hesitantly, and structured, while men solve problems quickly but less systematically and neatly. When viewed from the cognitive aspect, there is no significant difference in the ability to solve math problems in both men and women.

Several previous studies (Irhamna et al., 2020; Kurniawati, 2014; Noor, 2017) show the relationship between mathematics anxiety and problem-solving. Conversely, several studies (Davita & Pujiastuti, 2020; Fitriani et al., 2015; Kusumawati & Nayazik, 2017) also show the relationship between Gender and problem-solving. In addition, math anxiety and Gender have been investigated by several studies to find out the relationship between adaptive reasoning (Wijaya et al., 2019), mathematical understanding (Yuberta et al., 2020), and creative thinking (Pratiwi et al., 2019). However, few researchers still review mathematical problem-solving abilities in terms of mathematics anxiety and Gender. Thus, this study aims to know the differences in mathematics problem-solving abilities in mathematics anxiety and Gender in students. It is hoped that this research will be helpful for various parties, especially in the realm of education, regarding students' mathematical problem-solving abilities in terms of mathematics anxiety and Gender.

RESEARCH METHODS

The type of this research is quantitative research. Quantitative research is a type of research that observes a specific population or sample. The variables in this study are mathematics anxiety and Gender as the independent variables and problem-solving skills as the dependent variable. The research is in one of the junior high schools in Yogyakarta. The population in this study were students at a junior high school in Yogyakarta. This research involves 66 students of a Junior High School in Yogyakarta. The sampling technique used is a simple random sampling technique. The research instrument is in the form of tests and non-tests (questionnaires). The test uses five descriptive questions about Social Arithmetic to assess students' mathematical problem-solving abilities. While the non-test instrument used is a mathematics anxiety questionnaire. The mathematics anxiety questionnaire instrument is in the form of 15 questions with five choices of answers, namely strongly agree, agree, neutral, disagree, and strongly disagree, and is distributed using the Google form.

The written test instrument has passed a period of validity, discrimination, and difficulty index testing. The test was carried out because good evaluation data is valid or by reality. The non-test instrument (questionnaire) for mathematics anxiety consists of 15 questions. The function of the questionnaire is to find out how high and low students' mathematics anxiety is according to the Likert scale. There are three categories of mathematics anxiety scores, as shown in Table 1.

Table 1. The categories of mathematics anxiety scores

No.	Score	Criteria
1.	$x < M - 1\,SD$	High
2.	$M - 1\,SD \leq x < M + 1\,SD$	Medium
3.	$M + 1\,SD \leq x$	Low

In this study, the researcher chose inferential analysis as the data analysis in the form of a two-way ANOVA analysis of variance through SPSS 25 software. The

first stage was to calculate students' mathematics anxiety scores. Then, the second stage is to carry out the prerequisite test, namely the normality test and homogeneity test. The normality test uses the Kolmogorov-Smirnov test to determine whether the data is normally distributed. Meanwhile, to analyze homogeneity using Levene's test. If the data is normal and homogenous, then the data can be tested by applying 2-way ANOVA analysis.

RESULTS AND DISCUSSIONS

In this study, we will examine problem-solving abilities in terms of mathematics anxiety and Gender. After all the necessary data has been collected, proceed with processing the data using SPSS Statistics 25 software. The results of descriptive data processing are shown in Table 2.

Table 2. Descriptive Data

Mathematics anxiety	Gender	Mean	N
High	Male	53.0000	5
	Female	51.4286	7
	Total	52.0833	12
Moderate	Male	85.4167	24
	Female	83.0217	23
	Total	84.2447	47
Low	Male	91.2500	4
	Female	90.0000	3
	Total	90.7143	7
Total	Male	81.2121	33
	Female	76.9545	33
	Total	79.0833	66

Table 2 shows the results that 47 students have moderate Anxiety. Meanwhile, only seven students had low Anxiety. On the other hand, those with the greatest average score of problem-solving abilities are male students with a low level of mathematics anxiety with 91.2500. Meanwhile, those with the smallest average problem-solving ability score were female students with high mathematics anxiety, with a mean of 51.4286.

Furthermore, the data obtained was tested for normality. The Normality test is a prerequisite for carrying out the 2-way Anova test. Decision-making on the Normality test is based on the significance value. When the Sig value is > 0.05, the data is normally distributed. When the value of Sig. < 0.05, then the data is not normally distributed. The results of the Normality test with the Kolmogorov Smirnov in the SPSS application are shown in Table 3.

Table 3. Normality Test Results with Kolmogorov-Smirnov

	Levene's Test For Equality of Variances	
	F	Sig
Mathematics Problem Solving	0.842	0.460

According to Table 3, the results obtained from the Normality test with Kolmogorov-Smirnov show the value of Sig. of 0.200. Therefore, the data can be normally distributed because of the Sig. 0.200 > Sig. 0.05. After the Normality test is applied, the following prerequisite test is the Homogeneity test. The homogeneity test aims to identify whether the sample data come from populations with the same variance. The output of this homogeneity test is the variable variant of the problem-solving ability test result, which is homogeneous or not. The basis for concluding the homogeneity test is when the Sig. > 0.05, so the problem-solving ability test variable data is homogeneous, whereas the value of Sig. < 0.05 is the opposite. The results of the Homogeneity test with Levene's Test are shown in Table 4.

Table 4. Homogeneity Test Results with Levene's Test

	Sig
Mathematics Anxiety	0.460
Gender	0.411

In Table 4, it can be seen that the results of the Homogeneity test using Levene's Test show the Sig. of mathematics anxiety is 0.460 and the Sig. of Gender is 0.411. Therefore, the variable problem-solving ability test results are homogeneous. This conclusion is obtained because the value of Sig for mathematics anxiety and Gender is more than 0.05.

After the homogeneity test is carried out, the next step is to analyze the two-way Anova test results table. The basis for concluding the results of the Two-way Anova test is when the value of Sig. > 0.05, then there are differences in students' problem-solving abilities based on factor variables. However, when the Sig. <0.05, then there is no difference in students' problem-solving skills based on factor variables. The results of the Two-Way Anova Statistical Test are shown in Table 5.

Table 5. Two-way ANOVA Test Results

Source	**Sig**
Mathematics Anxiety	0.000
Gender	0.737
MathAnxiety*Gender	0.827

Based on Table 5, several Significance values were obtained, which would become the basis for concluding the research objectives. The observed data is the Sig value. On the line Anxiety, Gender, and Anxiety*Gender. On Anxiety, the value of Sig. of 0.000 or Sig. <0.05, so it can be interpreted that there is a significant difference between students' average mathematical problem-solving ability based on the level of mathematics anxiety. It proves that there is an influence of mathematics anxiety on students' mathematical problem-solving abilities. These results are relevant to Melisa (2019), where students' mathematics anxiety levels affect problem-solving abilities. Likewise, Lutfiyah et al. (2019) research results show that mathematics anxiety affects students' mathematical problem-solving abilities.

Furthermore, for Gender, the value of Sig. 0.737 or Sig. > 0.05, so it can be interpreted that there is no difference in students' mathematical problem-solving abilities based on Gender. It is shown that Gender does not affect students' mathematical problem-solving skills. It is similar to some research. The gender variable does not significantly affect students' mathematical problem-solving abilities (Murtafiah & Amin, 2018; Suharno, 2019). It is different from some research (Anggraeni & Herdiman, 2018; Annisa et al., 2021; Davita & Pujiastuti, 2020) that shows women has a higher average in mathematics problem-solving than male subject. The management of women's subject time influences. Women are better than men at completing the problem because women tend to go through the first step, solving problems that are considered difficult to do the other further.

Regarding problem-solving ability in mathematics anxiety and Gender, the value of Sig. 0.827 or > Sig. 0.05, so it can be interpreted that there is no interaction between students' mathematics anxiety levels and students' Gender in determining students' problem-solving abilities. This explanation shows no effect of mathematics anxiety and Gender on students' math problem-solving abilities. However, these results contradict the results of Melisa (2019) that there is an interaction effect between Anxiety based on Gender on problem-solving abilities and vice versa. The effect of Gender on math problem-solving abilities depends on the anxiety level of students. Meanwhile, the results of Wijaya et al. (2019) are relevant to the results of this study, namely that there is an adaptive mathematical reasoning ability that is affected by mathematics anxiety and Gender simultaneously. Still, only mathematics anxiety factors have a partial effect. It is in line with the results of research by Gierl & Bisanz (1995), who found no evidence of a difference in math anxiety between men and women. Santrock (2003) revealed that men's average mathematical performance is higher than women's, but not all men perform better than women.

CONCLUSIONS AND SUGGESTIONS

The study results show that for mathematics anxiety, the value of Sig. of 0.000 or Sig. <0.05, so there is an influence on students' problem-solving abilities when viewed from the students' mathematics anxiety level. However, for Gender, the value of Sig. 0.737 or Sig. > 0.05, so there is no difference in students' problem-solving abilities when viewed from the Gender of students. Regarding problem-solving ability in mathematics anxiety and Gender, the value of Sig. 0.827 or > Sig. 0.05, so it can be interpreted that there is no interaction between students' mathematics anxiety levels and students' Gender in determining students' problem-solving abilities. Finally, the level of mathematics anxiety has no interaction with the Gender of students in determining students' problem-solving abilities. Thus, the teacher can provide a treatment to reduce the negative influence and the level of Anxiety of mathematics so that students can carry out learning activities in good and optimal conditions.

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